

REMARKS

In the Claims:

Claims 1-9, 12, 14-21, 24, and 25 remain in this application. Claims 1, 2, 6, 7, 12, 15-19, and 21 have been amended. Claims 10, 11, 13, 22, and 23 have been withdrawn. New claims 24 and 25 have been added.

The Examiner indicated that claims 6-8, 15-16, and 18-20 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 6, 7, 15, and 16 have been so amended; claim 8 depends from claim 7, so also includes the same limitations. Only the format of claims 6-8, and 15-16 have changed; the meaning of the claims remain the same.

Claims 18 and 19 have been amended to recite many of the same limitations formerly present in the base claim. However, claims 18 and 19 now simply recite a “heater” rather than “a heater having a heating block portion and a heat nozzle portion” – mention of the two separate portions has been removed.

Rejections Under 35 U.S.C. 102(e):

Claims 1, 3-5, 9, 12, 14, 17, and 21 were rejected under 35 U.S.C. 102(e) as being anticipated by Quinones et al. (U.S. Pub. No. 2003/0194833) (hereinafter “Quinones”).

Quinones fails to disclose that an underfill material substantially fills a volume between the die and the substrate not filled by the connection material prior to applying more heat to a perimeter of a die than to a center of the die, as recited in amended claim 1. In Quinones, the temperature differential is applied to aid capillary action in moving underfill throughout the volume between the die and substrate. Thus, in Quinones the underfill may

substantially fill the volume between the die and substrate only after application of differential temperatures.

Quinones fails to disclose that the heat causes a plurality of connectors between the die and substrate to melt, as recited in amended claim 12. In Quinones, because the die is “electrically and mechanically connected to the substrate” by solder bumps at the time the encapsulant flows (Quinones: paragraph [0032]), it would be inadvisable to melt the connectors. If the solder bump connectors of Quinones were to be melted by the heat, the flowing encapsulant may carry the solder away from its intended placement and destroy the connection, rendering the device inoperable.

Quinones fails to disclose a device wherein applying more heat to a peripheral portion than a middle portion causes temperatures around substantially an entire perimeter of the heat nozzle and a temperature at the middle portion to be closer to equal than if the same amount of heat were applied to both the peripheral and middle portions, as recited in amended claim 17. Quinones, in contrast, is concerned with creating differing temperatures between various portions of the perimeter and other locations (see Quinones: Figs. 4, 13, and 14).

Claims 3-5 and 9 depend from claim 1, claim 14 depends from claim 12, and claim 21 depends from claim 17. Applicant thus requests that the Examiner withdraw the rejections of claims 3-5, 9, 14, and 21 for the reasons provided above.

Rejection Under 35 U.S.C. 103(a):

Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over Quinones. Claim 2 has been amended into independent form, including all limitations formerly found in claim 1. Only the format of claim 2 has changed; its meaning remains the same.

Quinones fails to disclose or suggest raising the center and perimeter of a die to temperatures in a range from about 200 to about 340 degrees Celsius, as recited in claim 2;

the rejection is unsupported and should be withdrawn. Such a temperature range may be useful to, for example, melt solder used to bond a die to a substrate (Specification, paragraph [0024]). Quinones, in contrast, is concerned with selectively heating underfill material to more efficiently move the underfill into a gap between a substrate and a die (see Quinones: Abstract and paragraphs [0013] and [0036]). Such temperature gradients may selectively vary the flow rate of the moving encapsulant within the gap (Quinones: paragraph [0013]). Quinones fails to disclose or suggest differential heat application to do anything besides aid the flow of encapsulant, and there is no indication that such encapsulant flow inherently involves the temperatures recited in claim 2.

Additionally, using Quinones to melt solder would make the device of Quinones unsuited for its intended purpose. As discussed above, Quinones is concerned with encapsulant flowing between the die and substrate. In Quinones, the die is “electrically and mechanically connected to the substrate” by solder bumps at the time the encapsulant flows (Quinones: paragraph [0032]). Thus, one of skill in the art would not use the device of Quinones to melt the solder, since such a melting may destroy the electrical and mechanical contact between the substrate and die as the encapsulant flows between the two structures; the flowing encapsulant may carry the solder away from its intended placement and destroy the connection.

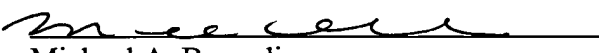
Finally, the Examiner appears to be taking Official Notice that one of skill in the art would know to use the device of Quinones to achieve such a temperature. Nothing in Quinones indicates that such a temperature is desired to aid in encapsulant flow. Nothing in Quinones indicates that the device of Quinones may be used to melt solder; as indicated above, Quinones appears to teach away from such a use. Thus, there is no disclosure or suggestion in Quinones to use the device of Quinones for a purpose that would include such

temperatures. Applicant requests that the Examiner cite a reference in support of the Examiner's assertion that one of skill in the art would use the device of Quinones for a purpose that would achieve such temperatures, or withdraw the rejection.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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